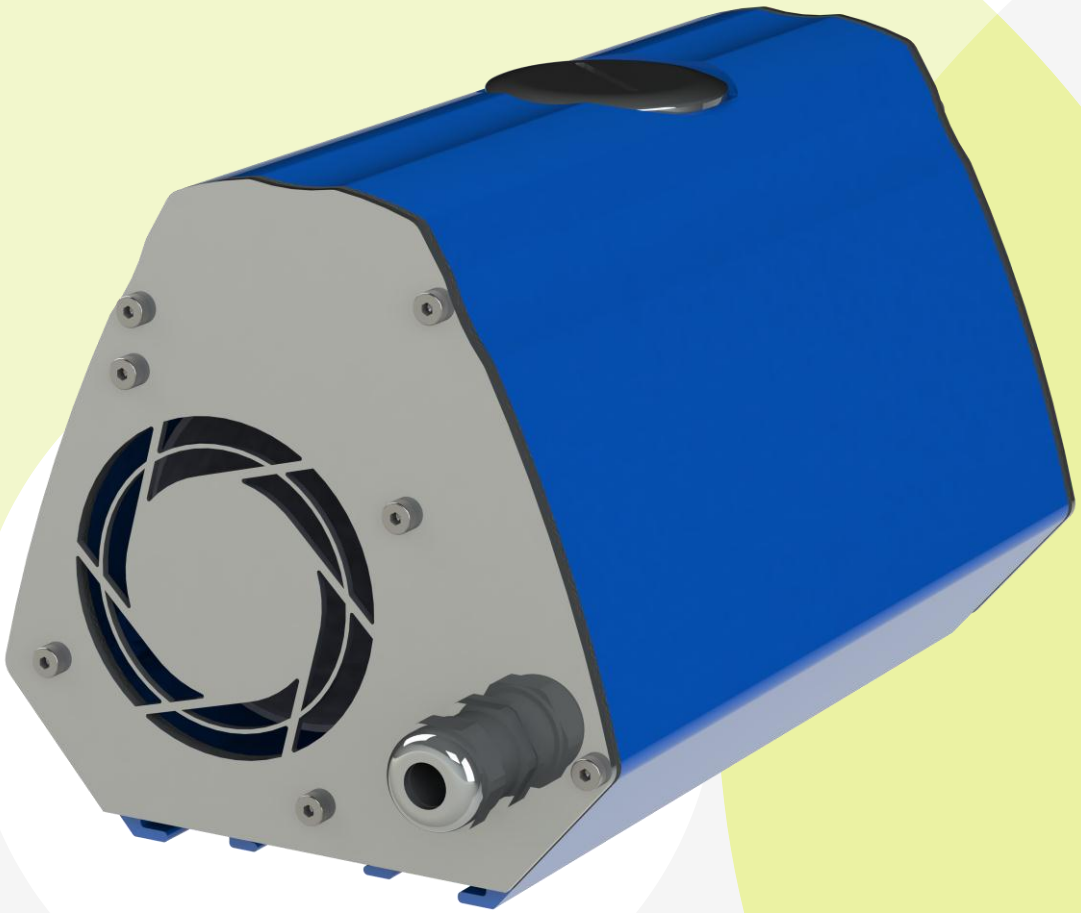

Sintrol DUMO

Manual

Version 1.2.3

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1 INTRODUCTION

This manual describes how to install and use SINTROL's DUMO dust monitor. Sintrol shall not be liable for any loss or damage whatsoever arising from use of any information or details therein, or omission or error in this manual, or any misuse of the product.

The instrument can be accessed by utilizing the DustTool Software.

The basic functionality of DustTool is to change the factory settings according to individual needs of the process.

Such functions for DUMO are for example:

- Perform the auto-setup according to process typical dust levels.
- Change the Alarm Limits and the logic of signals.
- Set 4 - 20mA output levels

The Software can be downloaded free of charge under the Sintrol web-site http://www.sintrolproducts.com

1.1 Safety

DUMO ambient dust monitor is virtually maintenance free. Under no circumstances should the user attempt to replace any components or the PC board. If, for some reason the monitor fails to operate, contact your local distributor or the manufacturer.

1.2 Product overview

The DUMO Dust monitor is a microprocessor-based, self-adjusting device, equipped with two independent and fully adjustable alarm signal and isolated 4 – 20 mA output loop.

The device is developed for continuous dust monitoring in industrial environment. It is a compact unit with the sensor and control electronics built into one IP20 enclosure, which has been specifically designed for easy installation and operation.

1.3 How does it work?

The DUMO uses Sintrol's proven and reliable inductive electrification technology where the interaction of particles with the sensor rod causes a small electrical charge to pass between the particulate and sensor.

It is this small electric charge that provides the signal monitored by the electronics, the signal generated is proportional to the ambient dust level even if particles accumulate on the sensor. Experience has shown that this method of monitoring dust level in ambient air offers accurate results with minimum maintenance.

Schematic diagram of the measurement principle is presented in Figure 1.

Figure 1 DUMO structure

2 INSTALLATION

2.1 Selecting the installation location

DUMO should be located so that measured data clearly represents dust concentration in a selected work environment. Because of this the user should always think carefully what he wants to monitor and where the device should be placed.

For example DUMO can be placed close to the cement mill if the user is interested in the variation of the amount of dust particles during the process. If the user is interested in dust concentration level in general, then DUMO should be located in a more “peaceful” place, some distance from the process.

There are still certain basic requirements for DUMO monitoring environment which one must take into account when preparing the measurements.

1. Temperature in measurement environment should be between -20 C and +40 C. The more stable temperature, the better.
2. Considerable humidity or condensed water is likely to drastically effect measurement.

3 WIRING

The DUMO comes with ten meter power and signal cable. There are 12 wires in the same cable, two wires for VDC power source, two for alarm signals, two for mA loop and one for automatic setup signal. Remaining wires are left for digital communication with Sintrol Dustlog software.

Connect the VDC power supply to pink (+) and GND to gray (-) wires. Blue and red wires are for alarm signals and they give the same voltage levels as power input voltage, when the alarm latches to high state.

PCB pin	Wire colour	Signal name
1	BLUE	Alarm signal 1
2	RED	Alarm signal 2
3	BLACK	4 – 20 mA +
4	YELLOW	4 – 20 mA -
5	GRAY	V- (GND)
6	PINK	V+ (VDC)
7	GREEN	Automatic setup
8	BROWN	RS 485 D+
9	WHITE	RS 485 D-
10	BLUE/RED	USB DM
11	GRAY/PINK	USB DP
12	VIOLET	USB VBUS

Table 1 Wiring and signals

For DUMO it is extremely important that it is grounded properly. The recommended grounding is presented below where DUMO cable shield is connected to power supply GND which is grounded properly to the stable ground.

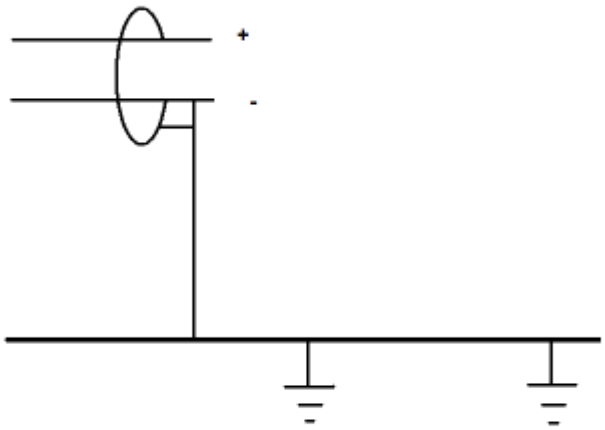

Figure 2 DUMO grounding

DUMO can be powered by using only USB connection for the purpose of accessing and adjusting parameters with appropriate Sintrol PC software. More information about parameter adjustment can be found in section 7 of this manual.

4 TECHNICAL SPECIFICATION

Product Name	DUMO
Measurement Objects	Solid particles in ambient air
Particle Size	0.3 µm or larger
Measurement Range	From 0.1 mg/m³
Measurement Principle	Inductive Electrification
Protection Category	IP20
Power Supply	24 VDC
Power Consumption	3 W
Cable Connection	10 meter cable, 12 wires
Output Signals	• Two output signals (100 – 280 mA) • Isolated 4 - 20 mA output loop
Communication Interface	• Serial communication RS-485 • USB • Radio frequency (RF) (optional)
Communication Protocol	• Modbus RTU (RS-485) • SNT network (USB, RF and RS-485)
Alarm Settings	• Set automatically by auto-setup based on average measured ambient air dust level: 5 times and 20 times of reference dust level. • User selectable
Signal Averaging Time	• Default at factory, 100 s • Adjustable from 0 – 6000 s
Alarm Delay Time	• Default at factory, 30 s

	• Adjustable from 0 – 60 000 s
Alarm Hysteresis Time	• Default at factory, 0s • Adjustable from 0 – 25 s

Ambient Conditions

Starting Temperature	-20...+40 °C
Running Temperature	-20...+40 °C
Humidity	Max 95 % RH (non-condensing)

Materials and Weight

Enclosure / casing	Aluminum, Stainless steel (AISI 316L)
Weight	approx. 3 kg

Table 2 Technical specification

5 DIMENSIONS

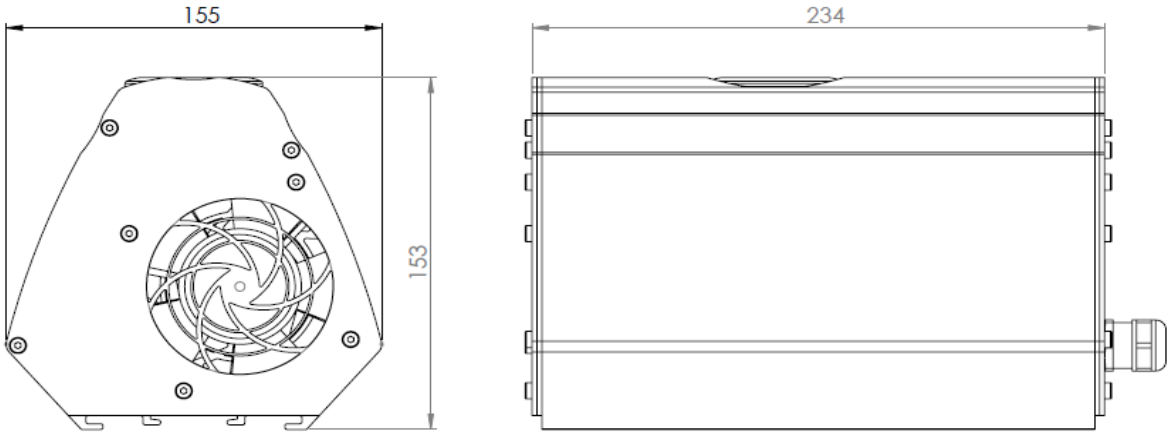

Figure 3 Dimensions

This instrument conforms to the following standards

CE	Product standard - electrical equipment for measurement, control and laboratory use – EMC requirements	Reference standard IEC 61326-1:2005 (First Edition)

6 OPERATION

DUMO measures the dust level in ambient air by using inductive electrification technology which is based on AC measurement of moving particles which carry a charge.

There are two alarm signal outputs to indicate two different alarm conditions, and 4 – 20 mA-output signal loop indicating dust level.

6.1 *The alarm threshold factory setting values*

Alert: > 5 times normal dust level (during automatic setup)

Alarm: > 20 times normal dust level (during automatic setup)

4 – 20 mA output: After auto-setup, the normal dust level is set to 5 % of total scale ie. 4.8 mA

ALARM SIGNALS	DUST LEVEL	mA LOOP 4 - 20mA	OPERATION
S1: LOW S2: LOW	-	-	Power OFF, failure or auto-setup failed
S1: LOW S2: HIGH	Dust level < Limit1	4 – 8 mA	Normal operation
S1: HIGH S2: LOW	Limit1 <= Dust level < Limit2	8 – 20 mA	Alert
S1: HIGH S2: HIGH	Dust level >= Limit 2	20 mA	Alarm

Table 3 Default operating configuration on factory settings

7 ADJUST PARAMETERS

Since every industrial process is different DUMO is designed so that parameters which are important to customer can be easily adjusted. Adjustment of parameters can be done by using USB, RS-485 or optionally with RF communication. Depending on the chosen communication method set to the device, the adjustments can be done either with Sintrol PC software or standard Modbus RTU master unit.

By default, the communication mode of the device is set to work with Sintrol PC software. To use MODBUS RTU communication, appropriate network parameters needs first to be set into the device.

7.1 Signal averaging time

DUMO damping time has been adjusted to 100 seconds in factory but it can be adjusted freely between 0 second and 6000 seconds (1 h 30 min).

7.2 Alarm level settings

Default DUMO alarm signal levels have been adjusted to 5 and 20 times, compared to the ambient air dust level during the automatic setup. These parameters and signal logic can be adjusted freely to be any levels required by the customer's process monitoring demands. If measuring calibration is enabled and calibration curve is defined, unit of these parameters is mg/m^3.

Ambient dust concentration level is always strongly dependent on measurement environment. Because of this it is recommended that user set alarm levels always in new measurement location or environment.

7.3 Alarm delay time

It is possible to set delay time for DUMO alarm signals to avoid false alarms caused by dust concentration peaks which may appear naturally in process. On factory settings, alarm delay is set to 30 seconds but it can be adjusted freely between 0 and 60 000 seconds.

7.4 Alarm hysteresis time

DUMO contains alarm hysteresis time parameter which sets the minimum frequency for alarm signal to change its stage. On a factory settings hysteresis time is set to 0 seconds but it can be set freely between 0 and 25 seconds.

7.5 *mA output signal*

Curve, which defines how mA output signal is controlled according to dust measuring values (concentration), can be set manually. Alternatively the curve can be determined by running auto-setup, as described in section 8.

7.6 *Calibration of measuring*

Dust measuring values can be shown as concentration values mg/m^3, if measuring calibration is enabled. By default, calibration curve (actually a straight line in this case) is defined by two points:

Dust measuring value	Concentration, mg/m^3
6807	0.20
9605	0.30

8 AUTO-SETUP

To be able to detect variations in dust follow and to generate alarm if there is excessive dust flow, you must determine the typical dust flow in the application when the process is operating normally.

The unit has an auto-setup function. With this, you can set the measuring range of the dust monitor so that a typical dust flow in the application corresponds 5% (4.8 mA) of the output scale.

Before running the auto-setup it is necessary to know that normal dust flow is running through the DUMO. When initiated, auto-setup sets the dust measuring parameters based on the normal dust flow.

After the auto-setup, by default alarm signals are set as follows:

- alert when the dust concentration exceeds 5 times the typical dust level.
- alarm when the dust concentration exceeds 20 times typical dust level.

In addition, the following key parameters will also be affected.

- 4 -20 mA high level is set to 20 times typical dust level and low level is set to 0
- Dust signal averaging time is set to default.
- Signal hysteresis and delay times are set to default.

For more information, see Table 3 Default operating configuration on factory settings.

NOTE

As the auto-setup procedure can also be altered by the user, this section only describes the actions of factory default auto-setup.

8.1 How to do the auto-setup?

Follow the procedure below to run the auto-setup.

1. Connect the power to the device. Make sure it is located in normal stable environmental conditions.

1. Then start the auto-setup procedure either:

    1.1 by connecting the automatic setup signal (green wire) to the V+ signal (wire) for a period of 1 second. The automatic setup will initiate. mA output is constant 4 mA during automatic setup.

    Then Release the automatic setup signal, by disconnecting the green wire from V+.

    1.2 or initiating auto-setup remotely using remote communication options.

Auto-setup procedure takes 10 times the signal averaging time ie. with the default parameters, this will be 1000 seconds (approx. 17 min) to complete. When auto-setup is finished, the DUMO is ready for use.

9 MAINTENANCE

DUMO dust monitor needs very little or practically no maintenance. However, the user should clean the measurement channel after some period of time. The cleaning period varies, depending on monitoring conditions and dust concentrations. The user should check the channel frequently.

10 TROUBLESHOOTING

10.1 No output signal

- Check the power and signal wiring are connected correctly.
- Check that there is power on.
- Do the auto-setup

If the monitor is not giving any output signal after these checks, contact your local distributor.

10.2 No response after auto-setup

- Check that there is normal process going on during auto-setup.
- Check that the power and signal wiring are connected correctly.

11 Appendix A: Sintrol PC software

The instrument can be controlled with Sintrol PC software provided they have appropriate bus interface available.

11.1 DustTool

DustTool is complementary software to help you to get easily control of the parameters and features of your Sintrol products.

The hardware requirements to run the software are:

- Windows XP, Vista or 7
- Screen resolution of 1024x768 pixels or more
- Minimum memory starting from 512 MB

The DustTool PC-software can be connected directly to the meters via USB. By using converter, also connections over RS 485 and RF are supported.

NOTE:

When customer uses PC-software to lock the device with *lock password* feature, changing any device parameters and running auto-setup is disabled. **If this password is set and lost, there is no way to unlock the device without contacting the manufacturer for the device specific master password**.

Preview

When DustTool software opens it looks for USB-connected Sintrol products. In case any products are connected, they will appear within the software and can directly be managed.

The main view of the software is illustrated below.

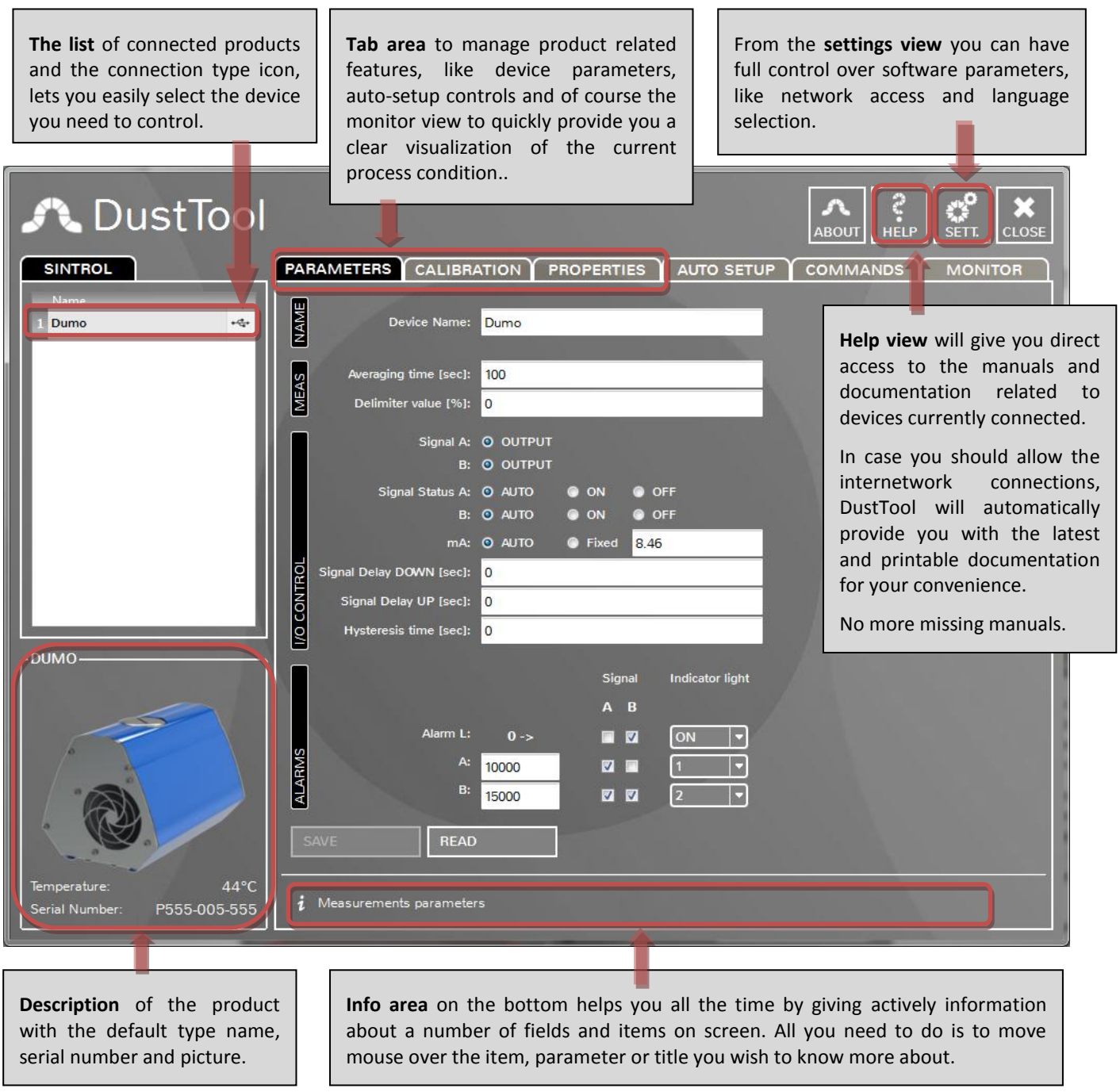
The list of connected products and the connection type icon, lets you easily select the device you need to control.
Tab area to manage product related features, like device parameters, auto-setup controls and of course the monitor view to quickly provide you a clear visualization of the current process condition..
From the settings view you can have full control over software parameters, like network access and language selection.
DustTool
ABOUT
HELP
SETT.
CLOSE
SINTROL
PARAMETERS
CALIBRATION
PROPERTIES
AUTO SETUP
COMMANDS
MONITOR
Name
1 Dumo
NAME
Device Name: Dumo
MEAS
Averaging time [sec]: 100
Delimiter value [%]: 0
I/O CONTROL
Signal A: OUTPUT
B: OUTPUT
Signal Status A: AUTO ON OFF
B: AUTO ON OFF
mA: AUTO Fixed 8.46
Signal Delay DOWN [sec]: 0
Signal Delay UP [sec]: 0
Hysteresis time [sec]: 0
ALARMS
Signal
A B
Indicator light
Alarm L: 0 ->
A: 10000
B: 15000
ON
1
2
SAVE
READ
DUMO
Temperature: 44°C
Serial Number: P555-005-555
Measurements parameters
Help view will give you direct access to the manuals and documentation related to devices currently connected.
In case you should allow the internetwork connections, DustTool will automatically provide you with the latest and printable documentation for your convenience.
No more missing manuals.
Description of the product with the default type name, serial number and picture.
Info area on the bottom helps you all the time by giving actively information about a number of fields and items on screen. All you need to do is to move mouse over the item, parameter or title you wish to know more about.

Figure 4 DustTool main window

On the parameters page, user can modify the operating parameters of the connected Dust meter. The basic operating principle to change parameters is:

1. Change parameter to the desired value
2. Press “Save” button to save the changes into the memory of the instrument. If the “Save” button is not pressed, the changes will not be sent to the device and the values will be lost at program shut down or when device is detached.

3. By pressing “Read”, the parameters which are currently saved in the instrument will be loaded from the device.

On the monitor view of the DustTool software it is possible to follow online the dust levels. Monitor view is intended to help user in decision when setting up parameters manually.

In order to further save measurement data, create additional signals and alarms and/or generate reports and history, commercial DustLog software is required.

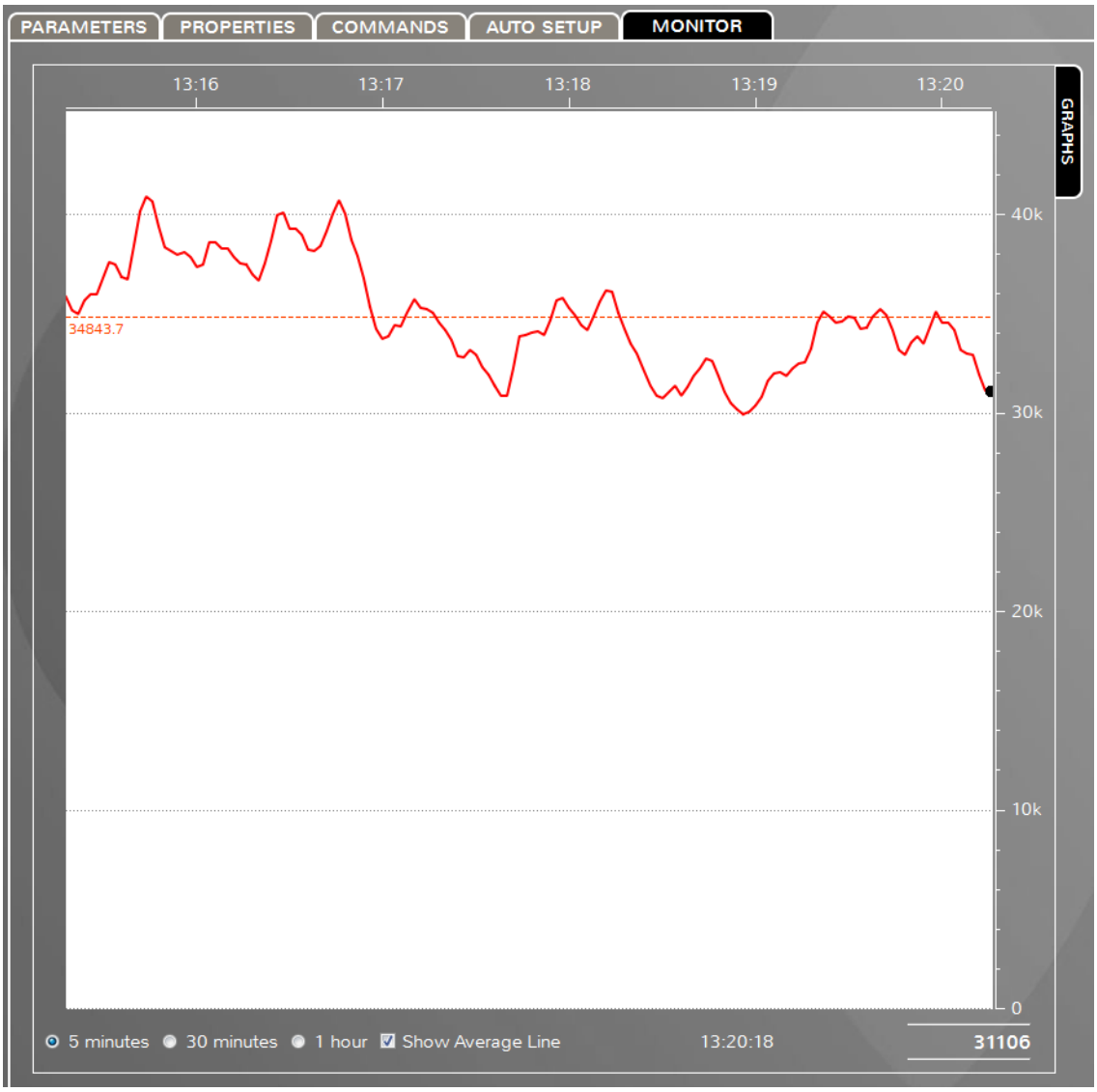

Figure 5 DustTool monitor view

11.2 DustLog

DustLog software starting from version 8, is a commercial product intended to meet real time data acquisition, storage and reporting needs for all Sintrol products and a variety of applications. DustLog software covers all the easy to use features available in the complementary DustTool software.

We recommend the use of Dustlog software for:

- comprehensive data storage
- data export option to third party software (f.ex. MS Excel)
- measurement history and reporting functionality
- history based calibration actions
- offsite data storage into multiple supported database servers.
- in the need of real time virtual signals and alarms
- when setting up or managing the whole measurement networks of
    - multiple different instruments
    - multiple different physical connections (RF or wires) within the same installation.
- professional real time monitor views from a number or different measurement points with powerful visualization and grouping options.

A wide range of reports can be generated to see historical trends in the measurement with the ability to generate monthly, daily or hourly averages charted on self-explaining graphs. Additionally, the easy user interface gives the plant the full control of the device's parameters so they can be read, sent or configured directly from the control room. After installation of the monitor, all access to the monitor controls can be done remotely using the Dustlog 8.

Further information regarding functionalities and costs of DustLog 8 can be obtained by our local distributors or under **http://www.sintrolproducts.com**

NOTES

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